

Name: \_\_\_\_\_

## CHEM 155B - QUIZ 1 - 2/14/23

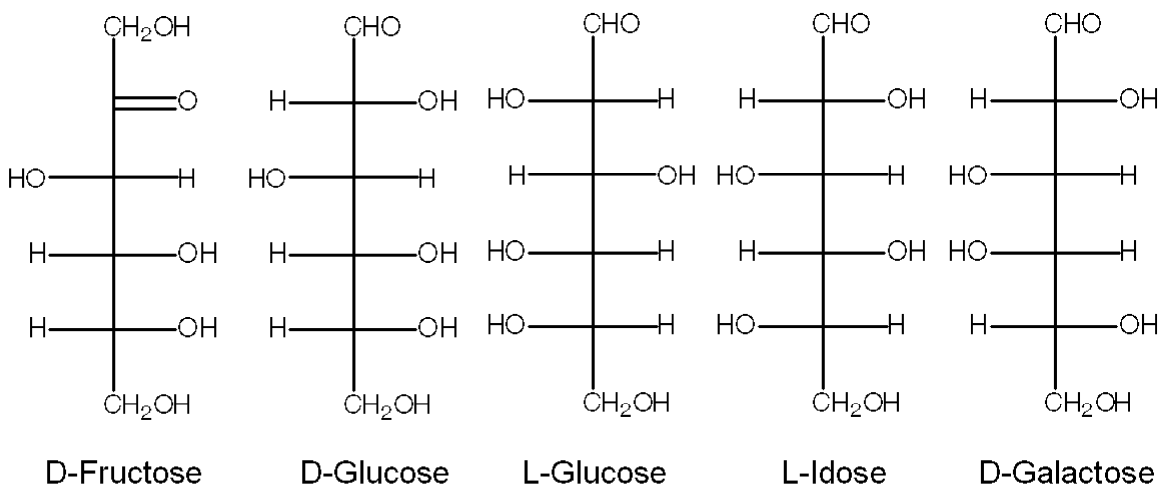
### Multiple Choice

Identify the choice that best completes the statement or answers the question.

$R=8.31 \text{ J}\cdot\text{mol}^{-1}\cdot\text{K}^{-1}$  and  $T=298 \text{ K}$  unless otherwise stated.

- \_\_\_\_\_ 1. According to thermodynamics, spontaneous reactions always
  - a. require energy to advance.
  - b. release energy when advancing.
  - c. involve oxidation steps.
  - d. involve reduction steps.
  
- \_\_\_\_\_ 2. Which of the following statements apply to anabolism?
  - a. proceeds in stages
  - b. consumes energy
  - c. is associated with reactions of metabolite reduction.
  - d. all of these
  
- \_\_\_\_\_ 3. In general, catabolism
  - a. is an oxidative process that releases energy
  - b. is a reductive process that releases energy
  - c. is an oxidative process that requires energy
  - d. is a reductive process that requires energy
  
- \_\_\_\_\_ 4. Dihydroxyacetone is a monosaccharide which contains three carbon atoms and a keto group. That makes it a:
  - a. aldotetrose
  - b. ketotriose
  - c. ketohexose
  - d. aldohexose
  
- \_\_\_\_\_ 5. Mirror image stereoisomers are called
  - a. anomers.
  - b. diastereoisomers.
  - c. enantiomers.
  - d. epimers.
  
- \_\_\_\_\_ 6. For the  $\alpha$  anomer of a D-sugar, the anomeric hydroxyl in a Haworth projection
  - a. has an upward projection (on the same side as the terminal  $\text{CH}_2\text{OH}$  group).
  - b. has a downward projection (on the opposite side from the terminal  $\text{CH}_2\text{OH}$  group).
  - c. may be either up or down, it depends on the individual sugar.
  - d. is non-existent; anomers are a consideration only in Fischer projections.

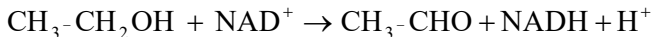
**Exhibit 1**



7. Refer to Exhibit 1. The enantiomer of D-glucose is:
- D-Fructose
  - D-Galactose
  - L-Glucose
  - L-Idose
8. Refer to Exhibit 1. Which of the following molecule is **NOT** a diastereoisomer of D-glucose:
- D-Fructose
  - L-Glucose
  - L-Idose
  - D-Galactose
9. Biochemists use a modified value for standard  $\Delta G$  values because
- the temperature to be considered in living systems is frequently above 298K.
  - the pH in living systems is rarely near 0.
  - the concentration of solvent (water) in living systems is not 1 molar.
  - the pressure in living systems is frequently above 1 atm.
10. "Metabolism" refers to
- the breakdown of larger molecules into smaller ones.
  - the production of larger molecules from smaller ones.
  - both of these
  - none of these
11. During a reaction of oxido-reduction, a reducer always ends up
- losing oxygen.
  - gaining oxygen.
  - losing electrons.
  - gaining electrons.

**Exhibit 15A**

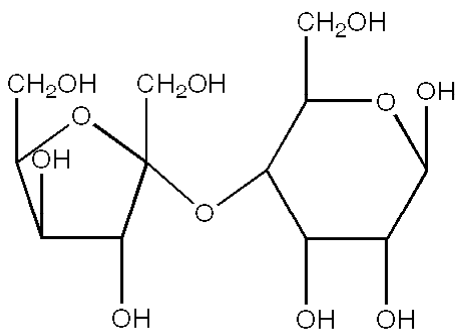
Consider the reaction of alcohol dehydrogenase.



ethanol

acetaldehyde

- \_\_\_\_\_ 12. **Refer to Exhibit 15A.** Which reactant is the stronger oxidant in this reaction?
- Ethanol
  - $\text{NAD}^+$
  - Acetaldehyde
  - NADH
- \_\_\_\_\_ 13. **Refer to Exhibit 15A.** Which reactant is eventually getting oxidized during this reaction?
- Ethanol
  - $\text{NAD}^+$
  - Acetaldehyde
  - NADH
- \_\_\_\_\_ 14. Which of the following best describes the glycosidic bond in the disaccharide shown?



- $\alpha(1-4)$
  - $\beta(1-4)$
  - $\alpha(2-4)$
  - $\beta(2-4)$
  - None of the above.
- \_\_\_\_\_ 15. Consider this reaction which has a  $\Delta G'^{\circ} = +0.4 \text{ kJ/mol}$ .  
 $\text{A} + \text{B} \leftrightarrow \text{C} + \text{D}$
- 1 M A, 1 M B, 0.1 M C and 0.1 M D are added to a container at 25 degrees Celsius. Note that  $R=8.31 \text{ J/mol/K}$  in these conditions. Which of the following statements is true?
- The reaction will proceed in the forward direction to reach equilibrium.
  - The reaction will proceed in the backward direction to reach equilibrium.
  - The reaction will not proceed in either direction; it is already at equilibrium.
  - Cannot be determined from the information provided.

- \_\_\_\_ 16. What physico-chemical property is used to primarily define lipids?
- ionic charge
  - melting point
  - solubility in aqueous solution
  - ability to bind metal ions
- \_\_\_\_ 17. Which of the following moieties is **not** present in a molecule of triacylglycerol?
- Phosphate
  - Fatty acid
  - Glycerol
- \_\_\_\_ 18. Which of the following four fatty acids has the lowest melting point?
- $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{COOH}$
  - $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{COOH}$
  - $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{COOH}$
  - $\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_2\text{COOH}$
- 1
  - 2
  - 3
  - 4
- \_\_\_\_ 19. Membranes are generally symmetrical, i.e., the outer leaflet is composed of the same number and types of phospholipids than the inner leaflet.
- True
  - False
- \_\_\_\_ 20. Which of the following modes of membrane transport is associated with the movement of a solute down its concentration gradient?
- Primary active transport
  - Facilitated diffusion
  - Secondary active transport

**CHEM 155B - QUIZ 1 - 2/14/23****Answer Section****MULTIPLE CHOICE**

- |   |        |   |
|---|--------|---|
| 1. ANS: B                                     | PTS: 1 | TOP: Biochemical Energetics                   |
| 2. ANS: D                                     | PTS: 1 | TOP: Metabolism                               |
| 3. ANS: A                                     | PTS: 1 | OBJ: Modified in 7e                           |
| TOP: Metabolism                               |        |   |
| 4. ANS: B                                     | PTS: 1 | TOP: Monosaccharide Structures                |
| 5. ANS: C                                     | PTS: 1 | OBJ: Modified from 5e                         |
| TOP: Monosaccharide Structures                |        |   |
| 6. ANS: B                                     | PTS: 1 | OBJ: New in 6e TOP: Monosaccharide Structures |
| 7. ANS: C                                     | PTS: 1 | TOP: Monosaccharide Structures                |
| 8. ANS: A                                     | PTS: 1 | TOP: Monosaccharide Structures                |
| 9. ANS: B                                     | PTS: 1 | OBJ: Modified from 5e                         |
| TOP: Modified Standard State for Biochemistry |        |   |
| 10. ANS: C                                    | PTS: 1 | OBJ: New in 6e TOP: Metabolism                |
| 11. ANS: C                                    | PTS: 1 | OBJ: New in 6e TOP: Oxidation and Reduction   |
| 12. ANS: B                                    | PTS: 1 | TOP: Oxidation and Reduction                  |
| 13. ANS: A                                    | PTS: 1 | TOP: Oxidation and Reduction                  |
| 14. ANS: C                                    | PTS: 1 | OBJ: Modified from 5e                         |
| TOP: Monosaccharide Chemistry                 |        |   |
| 15. ANS: A                                    | PTS: 1 | OBJ: New in 6e                                |
| TOP: Standard States for Free Energy Changes  |        |   |
| 16. ANS: C                                    | PTS: 1 | OBJ: New in 6e TOP: Definition of a Lipid     |
| 17. ANS: A                                    | PTS: 1 | OBJ: Modified from 5e                         |
| TOP: Chemical Natures of Lipids               |        |   |
| 18. ANS: D                                    | PTS: 1 | TOP: Chemical Natures of Lipids               |
| 19. ANS: B                                    | PTS: 1 | TOP: Biological Membranes                     |
| 20. ANS: B                                    | PTS: 1 | OBJ: New in 7e TOP: Membrane Functions        |